REMARKS

This is a response to the Office action dated September 17, 2004. The applicants have amended the specification, the abstract, and claims 14, 17, and 21. Claims 1-23 are pending. Applicants request reexamination and reconsideration of application.

In paragraph nos. 2-3 of the Office action, the Examiner rejects claim 1 as unpatentable for obviousness over El-Batal et al., U.S. Application Publication No. US2003/0221061 (El-Batal) and Okada, US Patent No. 6,381,675 (Okada).

The Examiner states that El-Batal teaches a coupling circuit for an ATA storage device as in claim 1, but notes it does not disclose a microcontroller adapted to control the coupling for the ATA connection.

The Examiner states that Okada teaches coupling circuit switches (Figures 1-3) and a microcontroller adapted to control the coupling circuit switches for the ATA connection.

The Examiner concludes it would have been obvious to combine El-Batal and Okada since they teach coupling circuit switches associated with each ATA disk for selectively connecting an ATA communication path of each ATA disk with a multiple controller and Okada's teaching of a microcontroller adapted to control the coupling circuit switches for the ATA connection would increase user friendliness of the ATA communication path control.

However, there is insufficient motivation to combine El-Batal and Okada. El-Batal relates to Serial ATA while Okada relates to parallel ATA. The electronics of ATA and SATA are very different. For example, SATA is based on low voltage differential signaling while ATA is based on 3.3 volt single ended CMOS signaling. This alone prevents the combination suggested.

Even if El-Batal and Okada are combined as suggested, they do not teach a coupling circuit for a Serial ATA storage device including a microcontroller as recited in claim 1. Each of Okada's switch devices 4a - 4f in Figures 1-3 do not have a microcontroller. Okada's CPU 10 is contained in the array controller 2a. If the CPU 10 of Okada fails, the array controller fails. This contrasts with the invention where failure of a microcontroller in a coupling circuit only generates failure of a single SATA storage device. This protects the ability to perform high data throughput. This claim limitation of a coupling circuit for a SATA storage device containing a microcontroller must be considered especially when missing from all the references. In view of the above, it is respectfully submitted that claim 1 is nonobvious and allowable.

In paragraph no. 4 of the Office action, the Examiner rejects claim 2 stating that El-Batal teaches out of band squelch control for activating the first Serial ATA controller-side transceiver receiving a first Serial ATA communication path, the second Serial ATA controller-side transceiver receiving a second Serial ATA communication path, and the Serial ATA storage device-side transceiver.

El-Batal mentions a Serial ATA specification published in August 2001 (SATA specification) in paragraph 5, but never incorporates by reference or cite to any pages of the SATA specification. Further, the SATA specification fails to describe the problem of noise that arises from out of band signaling in a coupling circuit and the solution of out of band squelch control in a coupling circuit for a SATA storage device as recited in claim 2.

El-Batal cannot teach what it does not mention. Specifically, El-Batal and the SATA specification fail to disclose out of band squelch control for activating a first Serial ATA controller-side transceiver receiving a first Serial ATA communication path and a second Serial ATA controller-side transceiver. Only the present invention teaches combining out of band squelch control component in a coupling circuit including a microcontroller as recited in claim 2. For example, Figures 8 and 11 disclose an out of

band squelch control component 86 connected to the storage side and controller side transceivers. It is respectfully submitted that claim 2 is patentable.

In paragraph no. 5 of the Office action, the Examiner rejects claim 14 based on Okada, but notes that Okada does not disclose the ATA storage devices are serial ATA storage devices but it would have been obvious to include El-Batal's teaching of SATA in order to simplify switching circuitry of Okada or increase adaptability of the prevailing SATA storage devices.

Amended claim 14 requires a data storage system for assigning control of Serial ATA storage devices, wherein each Serial ATA storage device connects through coupling circuit switches controlled by a microcontroller to storage controllers, comprising:

a host sending an I/O command identifying Serial ATA storage devices;

a first storage controller receiving the I/O command and commanding a microcontroller coupled to the coupling circuit switches to connect the Serial ATA storage devices identified in the I/O command to the first storage controller.

Amended claim 14 and its dependent claims 15-16 are allowable for reasons similar to those presented in connection with claim 1.

In paragraph no. 6 of the Office action, the Examiner rejects claim 17 based on Okada, but notes Okada does not disclose SATA storage devices. The Examiner states it would have been obvious to include El-Batal's teaching of SATA storage devices to simplify switching circuitry of Okada or increase adaptability of SATA storage devices.

Amended claim 17 requires a data storage subsystem for controlling Serial ATA storage devices, wherein each Serial ATA storage device connects through a coupling circuit containing a microcontroller to storage controllers, comprising:

a first storage controller; and

a second storage controller, wherein the first storage controller assigns the Serial

ATA storage devices to the first storage controller or the second storage controller and commands the microcontroller to control the coupling circuit to correspondingly connect the Serial ATA storage devices to the first storage controller or the second storage controller.

Amended claim 17 and its dependent claims 18-20 are allowable for reasons submitted in connection with claim 1.

In paragraph no. 7 of the Office action, the Examiner rejects claim 23 based on Okada, but notes that Okada does not disclose SATA storage devices. The Examiner states that it would have been obvious to include El-Batal's teaching of SATA storage devices to simplify switching circuitry of Okada or increase adaptability of the prevailing SATA storage devices.

However, even if El-Batal and Okada are combined as suggested they do not teach a coupling circuit for a Serial ATA storage device containing a microcontroller as recited in claim 23.

In paragraph nos. 8-12 of the Office action, the Examiner rejects claim 8-11 and 13 as unpatentable for obviousness over Pinson, U.S. Patent No. 6,256,748 (Pinson) in view of El-Batal. The Examiner states that Pinson discloses the method, but notes that Pinson teaches SCSI rather than SATA storage devices. The Examiner states that it would have been obvious to include El-Batal's teaching of SATA storage devices in order to reduce cost or increase simplicity for manufacture.

However, SATA and SCSI storage device are not interchangeable. A SCSI storage device uses a parallel interface, SCSI hardware, and SCSI protocols that are not compatible with Serial ATA technology. See enclosed pages 92-93 of Hard Disk Secrets (1993). There is no motivation for substituting SATA storage devices into a SCSI system and no citation justifying such substitution. If one substitutes SATA

storage devices in Pinson's SCSI based data storage system, it will not perform the method of claim 8. An obviousness rejection should not be based upon a combination of references that destroys the intent, purpose, or function of the invention disclosed in the reference.

Adding lower cost SATA storage devices in Pinson's data storage system will not lower overall costs as significant engineering will ensue to make these technologies compatible. Pinson's single ported SCSI storage drives are daisy chained in a common bus as shown in Figure 4, while the invention provides point to point connections with coupling circuits to SATA storage devices. It is not clear from the references what engineering would be required to achieve compatibility between SATA and SCSI technology because Pinson, El-Batal and the SATA specification fail to describe how to make SCSI and SATA compatible. In view of the above, claim 8 and its dependent claims 9-11 and 13 are nonobvious and allowable.

In paragraph no. 13 of the Office action, the Examiner rejects claim 21 as unpatentable for obviousness over Okada, El-Batal, and U.S. Patent No. 6,295,609 to Cargemel (Cargemel).

The Examiner states as follows:

(1) Okada teaches a method of restoring operation of an ATA storage device,

(2) Okada teaches detecting the ATA storage device has failed to respond to an I/O command within a predetermined time,

(2) Cargemel teaches the power up and down steps for storage devices generally,

(3) El-Batal teaches SATA storage devices, which are not mentioned by either Okada or Cargemel, and

(4) It would have been obvious to combine the references to increase user friendliness of repairing a failed storage device and to simplify switching circuitry of Okada or increase adaptability of the prevailing SATA storage devices.

As mentioned before Okada and El-Batal fail to teach commanding a coupling circuit containing a microcontroller. Cargemel relates to a surge protector that detects electrical faults in a SCSI data storage system and disconnects lines between controllers and disk drives. Cargemel is not directed to a method of restoring normal operation of a SATA storage device that has failed to respond to an I/O command within a predetermined time. El-Batal also fails to teach the method of restoring as in amended claim 21. Amended claim 21 recites commanding the coupling circuit containing the microcontroller to power down and up for restoring the operation of the SATA storage device. It is respectfully submitted that amended claim 21 is allowable.

In paragraph no. 14 of the Office action, the Examiner rejects claim 22 as unpatentable for obviousness over Okada, El-Batal, and Cargemel.

Applicants respectfully submit that claim 22 is allowable for the same reasons presented in connection with claim 1 as well as the additional limitations recited in claim 22.

In paragraph nos. 15-19 of the Office action, the Examiner rejects claims 3-7 as unpatentable for obviousness over El-Batal and Okada as applied to claim 1 above, and further in view of Cargemel.

Applicants submit that claims 3-7, all of which are dependent on claim 1, are allowable for the same reasons presented in connection with claim 1 as well as the additional limitations recited in each dependent claim.

In paragraph no. 20 of the Office action, the Examiner rejects claim 12 as unpatentable for obviousness over Pinson and El-Batal and Okada as applied to claim 8 above, and further in view of U.S. Patent No. 5,848,230 to Walker.

Applicants respectfully submit that claim 12, which is dependent on claim 8, is allowable for the same reasons presented in connection with claim 8 as well as the additional limitations recited in each dependent claim.

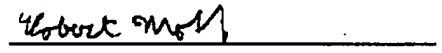
In paragraph nos. 21-23 of the Office action, the Examiner rejects claim 15, 16, and 18-20 as unpatentable for obviousness over Okada and El-Batal as applied to claim 8 above, and further in view of Pinson.

Applicants respectfully submit claims 15 and 16, all of which are dependent on amended claim 14, are allowable for the same reasons presented in connection with claim 14 as well as the additional limitations recited in each dependent claim.

Applicants respectfully submit claims 18-20, all of which are dependent on amended claim 17, are allowable for the same reasons presented in connection with claim 17 as well as the additional limitations recited in each dependent claim.

Please call if you have any question, comment, or it will expedite prosecution.

Respectfully Submitted,



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This process is an extreme example of *head translation* and *sector translation*, which are discussed in more detail in Chapter 7. Because of the air of unreality that SCSI drives present, they significantly limit the function of a program like SpinRite (although SpinRite still can do some wonderful things with these drives).

IDE

Currently, the most popular hard disk interface for the PC is the so-called *integrated drive electronics* (IDE) drive. The drive maker Conner Peripherals has popularized this approach, which includes an entire RLL or MFM controller on the drive itself, eliminating the need for a controller card. To connect to the computer, IDE drives do not take up a bus slot — one of the IDE drive's most attractive features. Instead, they use a special connector on the motherboard, which is, in effect, a minislot that carries only those bus slot signal lines that the IDE interface needs.

TECHNICAL SECRET

The formal name for this sort of connection strategy is *AT Attachment*, or ATA. A formal ATA standard has been adopted by the computer industry. This standard calls for a 40-pin connector of a particular design, with signals taken from the standard (ISA) PC input/output bus.

Many hard disks that have their controller electronics built onto the drive, technically speaking, are a kind of IDE drive. Yet they often are more commonly called by some other name. All SCSI drives have their drive electronics integrated onto the drive. IBM puts a form of ESDI drive, with its controller mounted on the drive, into some of its PS/2 models. In both these cases, therefore, you could say they are IDE drives. They are not IDE/ATA drives, however, because they do not use the 40-pin bus connector defined in the ATA specification. Using the designation SCSI or ESDI in these cases is more useful because it tells you something about the drive's capabilities rather than merely about its physical construction.

Many places in this book, as in much common parlance in the industry, IDE will be used as shorthand to refer to hard disks that have IDE with an ATA interface (see the preceding technical secret).

It is possible to put an IDE hard disk into a PC that does not have the ATA-specified connector on the motherboard. You accomplish this task by getting a so-called "IDE paddle card." This card is an option card that plugs into the system input/output bus and has the proper ATA connector on it. For convenience, because many AT hard disk controllers of the other types have a floppy disk controller on them, some paddle cards do also.

Because IDE drives, like SCSI drives, incorporate the entire drive controller on the drive, they can and many times will do some nonstandard things, such as sector translation. Indeed, most IDE drives have the capability of appearing to have any dimensions that you might want to give them. In other words, IDE drives can pretend to have whatever number of heads, cylinders, and sectors per track that your PC is expecting, provided that set of numbers describes a drive with no more capacity than the physical drive's actual capacity.

This capability is possible because at the lowest level, an IDE drive works just like a SCSI drive. Its interface electronics creates a single linear pool of blocks, addressed by their logical block addresses. Then the electronics translates this scheme into the three-dimensional one the PC is expecting.

IDE and SCSI hard disks share so much in common that you may be wondering what their differences are. First, of course, they differ in that they have different interfaces. You cannot plug a SCSI drive into an ATA connector, nor an IDE drive onto a SCSI bus.

In many cases, that is the only significant difference. You often can buy the same model of hard drive in a SCSI or an IDE version. But they are not all the same. In general, the industry provides the smaller drives in the IDE format and the larger ones in SCSI (with, as noted, a substantial range of overlap in which drives come in both flavors). The larger drives, and therefore mostly SCSI drives, tend to have more "intelligence" built in. That means, for example, that although it is quite common for a SCSI drive to support hot fixes, only a few IDE drives do.

How does the design of IDE and SCSI drives impact programs that work with the disk at a very low level, such as SpinRite and other disk reinterleaving programs? If the disk appears to the computer exactly as an MFM or RLL drive, SpinRite often can treat it like one. But if, as is more common, the disk masks some of its real personality, it will prevent SpinRite and any other low-level reformatting programs from performing all their functions. These programs may still provide useful services, just not everything they can do for MFM, RLL, and most ESDI drives.

disks on an option card

Several years before the introduction of IDE hard disks, the Plus Development Corporation (now Quantum Corporation) made a similar departure from the usual approach, but in the opposite direction. The company wanted to integrate the drive and its electronics, but instead of doing so on a drive to be mounted in the usual manner, they moved the hard disk onto the controller card. Since Quantum's first Hardcard was introduced in 1985, many other drive makers have introduced similar products. Quantum's models have evolved from an initial 10MB capacity to units able to store several hundred megabytes, yet each one still fits into a single slot in a PC.